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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/042,878  | 01/09/2002  | Mark O. Neisser      | 2002US304           | 5290             |
| 26289   | 7590        | 04/19/2005           | EXAMINER            |                  |
| CLARIANT CORPORATION<br>ATTENTION; INDUSTRIAL PROPERTY DEPT.<br>70 MEISTER AVENUE<br>SOMERVILLE, NJ 08876 |             |                      | BARRECA, NICOLE M   |                  |
|   |             |                      | ART UNIT            | PAPER NUMBER     |
|   |             |                      | 1756                |                  |

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/042,878

Applicant(s)

NEISSER ET AL.

Examiner

Nicole M. Barreca

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 16-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-12, 14, 16-26 is/are rejected.
- 7) ☒ Claim(s) 13 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. Claims 1-14 and 16-26 are pending in this application.
2. The 35 USC 112 second paragraph rejection of claims 1-26 has been withdrawn in response to the applicant's amendments and/or arguments on p.7.

#### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-8, 16-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hause (US 6090694) in view of Brown (US 5882967), Meador (US 5919599) and Hyakutake (US 5994006).
5. Hause discloses a patterning method. Organic ARC layer 160 is spun on a wafer and baked, followed by photoresist layer 170. The photoresist and ARC are exposed to UV light through a mask (Fig. 1C). The pattern is developed in both the resist and ARC to form via openings (Fig.1D). A positive photoresist process is described, but a negative photoresist could also be used (col.2, 7-16, col.4, 1-27). Hause is silent on the developer used and does not disclose using an aqueous alkaline developer such as tetramethylammonium hydroxide (TMAH). Brown teaches that in a typical photolithographic process, the photoresist is developed with TMAH (col.1, 46-59). It

Art Unit: 1756

would have been obvious to one of ordinary skill in the art to use TMAH as the developer in the method of Hause because Brown teaches that TMAH is a conventional developer in the photolithographic art. Hause is silent on the (pre)baking conditions. It would have been within the ordinary skill of one in the art to determine the required prebaking conditions, dependent on the specific ARC and photoresist compositions and thicknesses used. Hause is silent on the solids content and thickness of the ARC layer. Meador teaches that the solids content of an ARC composition is adjusted typically to about 2.5-10 wt % in order to achieve the desired 500-2500 angstrom film thickness (col.7,36-39), thereby establishing ARC solids content a result-effective variable. Hyakutake teaches that the thickness of the antireflective layer depends on the wavelength of the exposure light (col.3, 16-18) and is therefore a result-effective variable. It would within the ordinary skill of one in the art to determine the optimal solids content and film thickness of the ARC layer in the method Hause in view of Brown by routine experimentation and to a solids content up to about 8% and a maximum coating thickness of the wavelength of light divided by twice the refractive index, if required, because the solids content and thickness of an ARC layer are a result-effective variables, as taught by Meador and Hyakutake, respectively and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch*, (617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

6. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hause in view of Brown, Meador and Hyakutake as applied to claim 1 above, and further in view of Puligadda (US 6,323,310).

Art Unit: 1756

7. Hause discloses an organic BARC but is silent on the specific ARC composition and does not disclose that the BARC composition comprises a polymer-bound or nonpolymer-bound dye. Puligadda teaches that BARC compositions typically consist of an organic polymer which provides coating properties and a dye for absorbing light. Puligadda also teaches that the dye is either blended into the composition (nonpolymer-bound) or chemically bounded to the polymer (col.1, 27-33). It would have been obvious to one of ordinary skill in the art to have the BARC composition in the method of Hause (in view of Brown, Meador and Hyakutake) comprise a dye because Puligadda teaches that BARC compositions typically consist of an organic polymer which provides coating properties and a dye for absorbing light. It would have also been obvious to one of ordinary skill in the art to have the dye be polymer or nonpolymer bound because Puligadda teaches that dyes are either blended into the composition or chemically bound to the polymer.

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hause in view of Brown, Meador and Hyakutake as applied to claim 1 above, and further in view of Dichiara (US 5482817).

9. Hause is silent on the ARC composition and does not disclose that the BARC composition comprises a polymer derived from the claimed Markush group. Dichiara teaches that an antireflective composition comprising a polymer of polyvinyl naphthalenes, such as 2-vinyl naphthalene, is highly absorbent to mid and deep UV light (col. 2, 11-27, example 3). It would have been obvious to one of ordinary skill in the art to have the ARC composition in the method of Hause (in view of Brown,

Art Unit: 1756

Meador and Hyakutake) comprise a polymer derived from 2-vinylnaphthalene because Dichiara teaches that such an ARC composition is highly absorbent to mid and deep UV light.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hause in view of Brown, Meador and Hyakutake as applied to claim 1 above, and further in view of Samuels (US 6268907).

11. Hause does not disclose baking the resist between the exposure and development steps. Samuels teaches that it is known in the prior art to perform a post-exposure bake (PEB) in order to eliminate standing waves (col.2, 7-19). It would have been obvious to one of ordinary skill in the art to perform a PEB on the resist in the method of Hause (in view of Brown, Meador and Hyakutake) because Samuels teaches that this is a conventional step in the prior art known to eliminate standing waves.

12. Claims 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hause in view of Brown, Meador and Hyakutake as applied to claim 1 above, and further in view of Malik (US 6,312,870).

13. Hause is silent on the specific photoresist and does not disclose that the photoresist composition comprises an acrylate, methacrylate, or a polyhydroxystyrene polymer. Malik teaches that photoresist compositions containing copolymers of t-butyl acrylate or methacrylate and hydroxystyrene monomers are known in the art (col.1, 17-19). It would have been obvious to one of ordinary skill in the art to use a photoresist composition comprising an acrylate, methacrylate, or a polyhydroxystyrene polymer in the method of Hause (in view of Brown, Meador and Hyakutake) because Malik teaches

Art Unit: 1756

that photoresist compositions containing copolymers of t-butyl acrylate or methacrylate and hydroxystyrene monomers are known in the art.

14. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hause in view of Brown, Meador and Hyakutake as applied to claim 1 above, and further in view of Yoon (US 6,537,727).

15. Hause is silent on the specific photoresist and does not disclose that the photoresist composition comprises a cycloolefin/maleic anhydride copolymer. Yoon teaches that a cycloolefin/maleic anhydride copolymer is a conventional resist composition (col.1, l.66-col.2, l.4). It would have been obvious to one of ordinary skill in the art to use a photoresist composition comprising a cycloolefin/maleic anhydride copolymer in the method of Hause (in view of Brown, Meador and Hyakutake) because Yoon teaches that a cycloolefin/maleic anhydride copolymer is a conventional resist composition.

***Allowable Subject Matter***

16. Claim 13 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

17. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach or suggest a radiation sensitive, aqueous alkaline developable BARC composition, used in the steps of the claimed method, which comprises a terpolymer of N-methylmaleimide, MLMA, and MAdMA.

***Response to Arguments***

18. Applicant's arguments filed 3/1/05 have been fully considered but they are not persuasive. The applicant argues that Hause does not disclose a radiation sensitive photoimageable bottom antireflective layer, which is developed along with the photoresist in a single step. However this exactly what is taught in the first embodiment of Hause. See specifically col.4, l.21-30 where the photoresist 170 and the ARC 160 are exposed to UV light, i.e. the ARC layer is radiation sensitive and photoimageable. This corresponds to Fig.1C, illustrating exposed portions of both layers. The exposed portion (of the photoresist and ARC) are removed by developing and "the result of developing the photoresist layer 170 and ARC layer 160 is the formation of a first via opening 220 and second via opening 222." This corresponds to Fig.1D, illustrating removal of both layers. While col.5, l.14-19 is argued by the applicant as teaching that the ARC layer is removed at a different time than the photoresist, this description refers to a different embodiment of Hause wherein the ARC layer is not organic (see col.4, l. 63-65) and was not used by the examiner in the applied rejection. Hause is silent on the specific developer used and does not disclose that the developer is an aqueous alkaline developing solution. However almost all photoresist developers conventionally used in the art are aqueous alkaline solutions, such as TMAH. This newly added limitation has been addressed in the preceding rejection as being taught by Brown.

19. The applicant argues that the ARC layer is dry etched in Meador and Hyakutake. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are



Art Unit: 1756

based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Meador was cited to teach that the solids content of an ARC composition is typically adjusted to about 2.5-10 wt % in order to achieve the desired 500-2500 angstrom film thickness and Hyakutake was cited to teach that the thickness of the antireflective layer depends on the wavelength of the exposure light. These references were recited only to teach that the solids wt% and thickness are known to be result-effective variables in the antireflective art. These references teach general properties of antireflective layers and would be applicable to all types of antireflective materials, both organic, which are generally removed with developing the photoresist and inorganic, which are generally dry etched.

20. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

### ***Conclusion***

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

Art Unit: 1756

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1756

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca  
Examiner  
Art Unit 1756

4/12/05

A handwritten signature in black ink, appearing to read "Nicole Barreca", written in a cursive style.